

1. A line contains two points $A(-3, 1)$ and $B(2, 11)$.

- a. Determine the slope/rate of change of the line.

$$\begin{array}{cc} (-3, 1) & (2, 11) \\ +5 & +10 \end{array} \quad \frac{\Delta y}{\Delta x} = \frac{10}{5} = \boxed{2}$$

- b. Determine an equation of the line in slope-intercept form.

$$\begin{array}{l} y = mx + b \\ y = 2x + b \end{array} \quad \begin{array}{cc} (2, 11) & \\ x & y \end{array} \quad \begin{array}{l} 11 = 2(2) + b \\ 11 = 4 + b \\ b = 7 \end{array} \quad \boxed{y = 2x + 7}$$

- c. Determine the coordinates of the x-intercept of the line.

$$\begin{array}{l} \text{x-intercept} = \text{when } y = 0 \\ 0 = 2x + 7 \rightarrow -7 = 2x \\ x = -\frac{7}{2} \end{array} \quad \boxed{\left(-\frac{7}{2}, 0\right)}$$

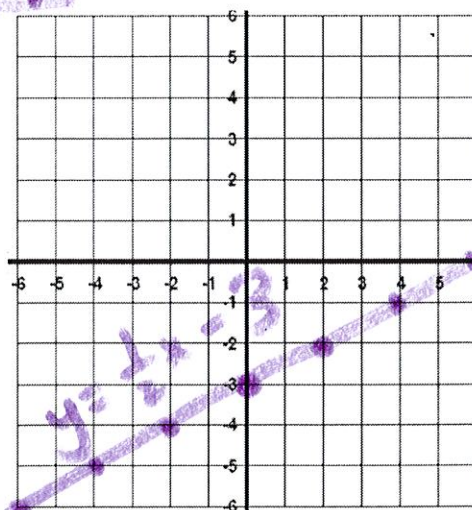
- d. Determine the coordinates of the y-intercept of the line.

$$\begin{array}{l} \text{y-intercept when } x = 0 \\ y = 2(0) + 7 \\ y = 0 + 7 = 7 \end{array} \quad \boxed{(0, 7)}$$

- e. **Challenge:** Convert the equation found in part (b.) above to standard form.

$$\begin{array}{l} \text{Standard form} = ax + by = c \\ y = 2x + 7 \\ -2x - 7y = -14 \end{array} \quad \boxed{-2x + y = 7}$$

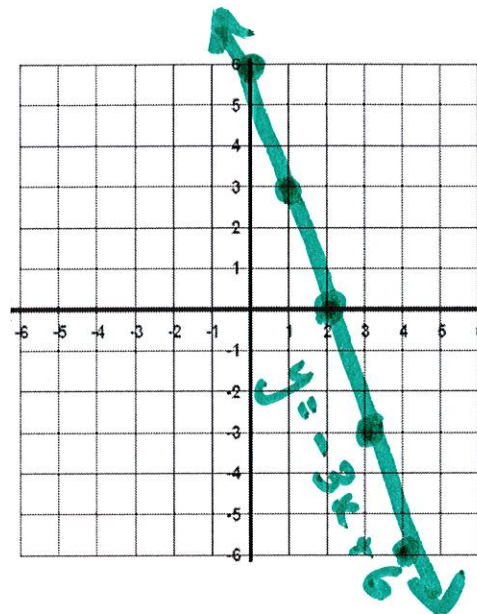
2. Graph the line with equation $y = \frac{1}{2}x - 3$



3. A line contains two points $P(2, 3)$ and $T(7, 3)$. Determine an equation for the line.

$$\begin{array}{l} \frac{\Delta y}{\Delta x} = \frac{0}{5} = 0 \\ y = mx + b \\ y = 0x + b \\ y = 0x + 3 \\ y = 3 \end{array} \quad \begin{array}{l} (2, 3) \\ 3 = 0(2) + b \\ 3 = b \end{array} \quad \boxed{y = 3}$$

4. Graph the line with equation $y = -3x + 6$



5. A line contains two points $M(-1, 5)$ and $N(-1, -4)$. Determine an equation for the line.

$$\frac{\Delta y}{\Delta x} = \frac{-9}{0} = \text{undefined}$$

vertical line!

$$\boxed{x = -1}$$

6. Find an equation of the line with slope $m = 3$ and y-intercept $P(-7, 1)$.

typo!

$$y = ???$$

7. Find an equation of the line with slope $m = \frac{5}{3}$ and y-intercept $b = -10$.

$$y = mx + b$$

$$\boxed{y = \frac{5}{3}x - 10}$$

8. Sabrina gets in her cab and notices the initial up-front fee on the meter. After 2 minutes, the meter reads \$7.50 and after 7 minutes, the meter reads \$13.75.

a. What is the rate of change in this scenario?

$$\frac{\Delta y}{\Delta x} = \frac{6.25}{5} = 1.25 \text{ \$ per minute}$$

Handwritten notes: $(2, 7.50)$ and $(7, 13.75)$ are connected by a bracket labeled $+5$ (representing Δx). Another bracket labeled $+6.25$ (representing Δy) connects the y-values.

b. What is the equation or rule or formula that gives the cab fare as a function of time?

$$y = mx + b$$

$$y = 1.25x + b$$

Handwritten work for finding b :

$$7.50 = (1.25)(2) + b$$

$$7.50 = 2.50 + b$$

$$7.50 - 2.50 = 2.50 + b - 2.50$$

$$5 = b$$

The final equation is boxed: $y = 1.25x + 5$

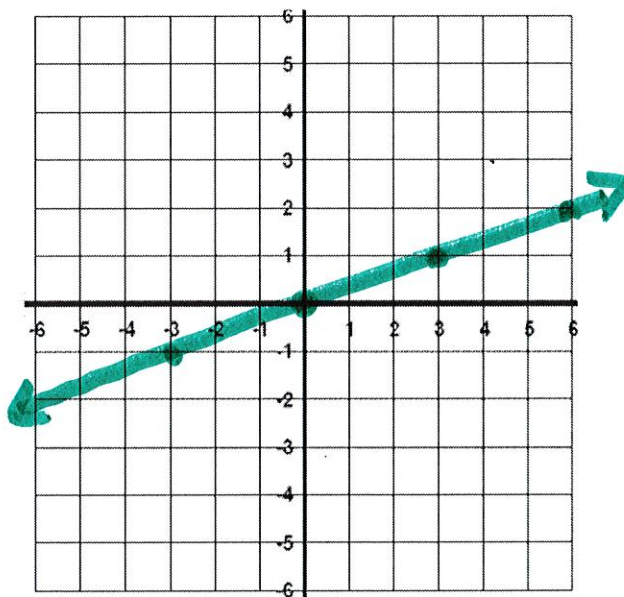
c. How much would a 15-minute cab ride cost?

$$y = 1.25(15) + 5$$

$$y = 18.75 + 5 = 23.75$$

The final answer is boxed: 23.75

9. Graph the line with equation $y = \frac{1}{3}x + 0$



10. Determine an equation of the line that contains the point $P(-5, 2)$ and is parallel to the line with equation $2x - 3y = -6$.

switch to slope-intercept form!

$$\begin{aligned} 2x - 3y &= -6 - 2x \\ -3y &= -6 - 2x \\ \frac{-3y}{-3} &= \frac{-6}{-3} - \frac{2x}{-3} \\ y &= 2 + \frac{2}{3}x \end{aligned}$$

parallel lines have same slope!

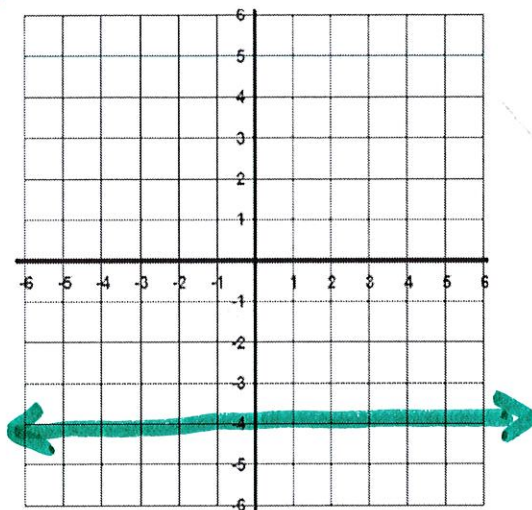
$$y = \frac{2}{3}x + 2 \rightarrow y = \frac{2}{3}x + B$$

$$2 = (-5)\frac{2}{3} + B$$

$$2 = -\frac{10}{3} + B \quad B = \frac{16}{3}$$

$$\boxed{y = \frac{2}{3}x + \frac{16}{3}}$$

11. Graph the line with equation $y = -4$



12. Determine an equation of the line that contains the point $P(-1, -5)$ and is perpendicular to the line with equation $8x - 2y = 5$.

switch to slope-intercept form!

$$\begin{aligned} 8x - 2y &= 5 - 8x \\ -2y &= 5 - 8x \\ \frac{-2y}{-2} &= \frac{5}{-2} - \frac{8x}{-2} \\ y &= -\frac{5}{2} + 4x \end{aligned}$$

opposite, reciprocal slope

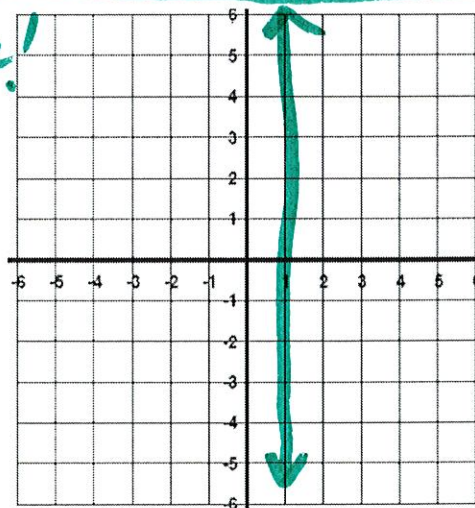
$$y = 4x - \frac{5}{2} \rightarrow y = -\frac{1}{4}x + B$$

$$-5 = -\frac{1}{4}(-1) + B$$

$$-5 = \frac{1}{4} + B \quad B = -4\frac{3}{4}$$

13. Graph the line with equation $x = 1$

vertical line!



$$\boxed{y = -\frac{1}{4}x - 4\frac{3}{4}}$$

14. Determine which tables contain data representing a linear function.

linear means
a constant $\frac{\Delta y}{\Delta x}$

a.

x	y
3	1
6	2
9	3
12	4
15	5

$\frac{1}{3} = \frac{2}{6}$ linear ✓

b.

X	y
1	3
2	5
3	7
4	9
5	11

linear ✓

c.

x	y
-1	1
-2	2
-3	3
-4	4
-5	5

linear ✓

d.

x	y
-4	-10
-2	-5
0	0
2	5
4	10

linear! They're all linear!

15. A water pump can remove water from a pool at a constant rate. 84 gallons are removed in 4 minutes and 189 gallons are removed in 9 minutes. What is the rate in gallons per minute at which the water is being pumped out of the pool? What is a rule or equation or formula that represents the amount of water being pumped out as a function of time? How many gallons are pumped out after one hour?

(4 min, 84 gall) (9 min, 189 gall)

rate of change: $\frac{\Delta y}{\Delta x} = \frac{105}{5} = 21$ gallons/min

$y = 21x + B$
 $84 = 21(4) + B$

$84 = 84 + B$
 $0 = B!$

$y = 21x$

one hour!
 $y = 21(60) = 1260$ gallons

16. A linear pattern is drawn using circles and following the equation $y = 6x + 2$.

a. Write out how many circles there would be in Step 0, Step 1, Step 5, and Step 21.

Step 0
 $6(0) + 2 = 2$

Step 1
 $6(1) + 2 = 8$

Step 5
 $6(5) + 2 = 32$

Step 21
 $6(21) + 2 = 131$

b. What is the slope or rate of change of this pattern?

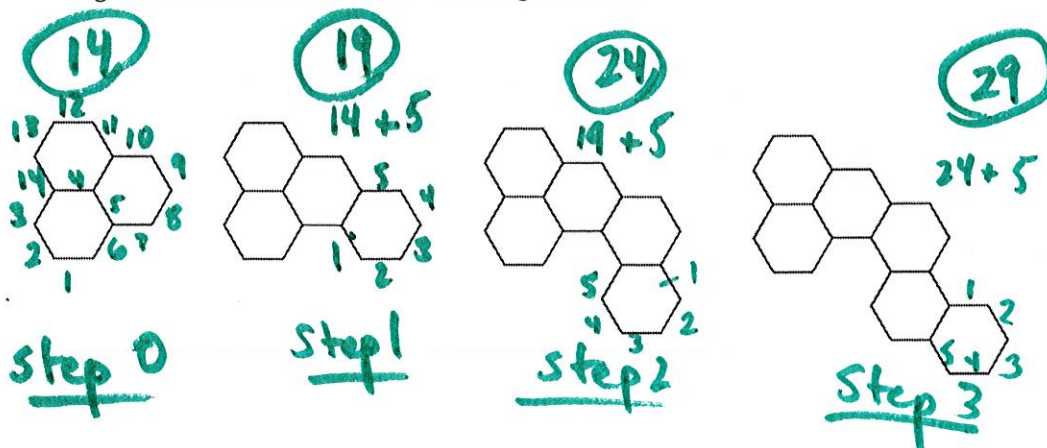
+6 each step

c. What step number would have 308 circles?

$308 = 6x + 2$
 $-2 \quad -2$
 $306 = 6x$

$x = 51$
 Step 51

17. Considering the number of line segments in each drawing or term, what is the rate of change in the sequence of drawings? Write a formula that represents the pattern. How many line segments would be in the 20th drawing or term?



Rate of change = +5 line segments each step

$$y = 5x + B$$

$$y = 5x + 14 \quad \leftarrow \# \text{ @ step 0}$$

20th step =

$$y = 5(20) + 14 = 100 + 14 = \boxed{114}$$